Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Social and Behavioral Sciences 23 (2011) 67–68

Procedia Social and Behavioral Sciences

Academy of Aphasia 2011

Age of Acquisition Effects on Chinese Character Recognition: Evidence from EEG

Brendan Weekes[a,*]

[a] *University of Hong Kong*

Introduction

The age that a word is acquired called the age of acquisition (AoA) has an effect on word recognition in Chinese speakers (Weekes, Chan & Tan, 2008). One account of AoA effects called the arbitrary mapping (AM) hypothesis assumes AoA effects depend on the predictability of the correspondences between orthography and phonology, i.e. the effect of AoA will be of greater magnitude when these correspondences are not predictable. The Chinese script uses a non-alphabetic orthography where mappings between orthography and phonology are arbitrary, making the majority of characters unpredictable. However, the pronunciation of some characters can be predicted from generalizable knowledge about the mappings between orthography and phonology that are represented in phonetic radicals. We used EEG methods to test the claim that AoA effects will be greater for characters containing predictable radicals than unpredictable characters (Liu, Hao, Hua, & Weekes, 2008).

Methods

Ten undergraduates (aged 18-30 years) were tested using a within-participants design with AoA (Early, Late) and Regularity (Regular, Irregular) as critical variables. Items were matched for frequency, regularity and stroke number (all Fs<1). A visual lexical decision task was used. EEG signals were recorded continuously using a 128 channel Geodesic Sensor Net connected to an AC coupled, 128-channel high input impedance amplifier (EGI, Eugene, Oregon). Voltage was referenced to a vertex electrode. Individual electrodes were adjusted until impedances were below 50 kΩ. Trials contaminated by eye blinks, movements or muscle potential exceeding 150μV at any electrode were excluded. EEG analyses used voltage change data grand averaged to 600 msec post stimulus onset (window included 300-500 msec post onset and 500-700 msec post onset).

Results

Results are summarised in Figure 1. In the time window 300-500 msec, an ANOVA found an effect of AoA ($F_{(1,6)} = 4.08$, $p<.01$), no effect of regularity. and no interaction between AoA and regularity (all Fs<1). In the window 500-700 msec, ANOVA found an effect of AoA $F_{(1,6)} = 9.18$, $p<.01$ no effect of regularity and no interaction between AoA and regularity (all Fs<1). There was an effect of electrode position (posterior versus anterior) $F_{(2,54)} = 6.14$, $p<.01$. Mean voltage change was significantly greater at anterior than posterior sites for all items (all ps<.05).

* Corresponding author.
E-mail address: weekes@sussex.ac.uk .

doi:10.1016/j.sbspro.2011.09.173

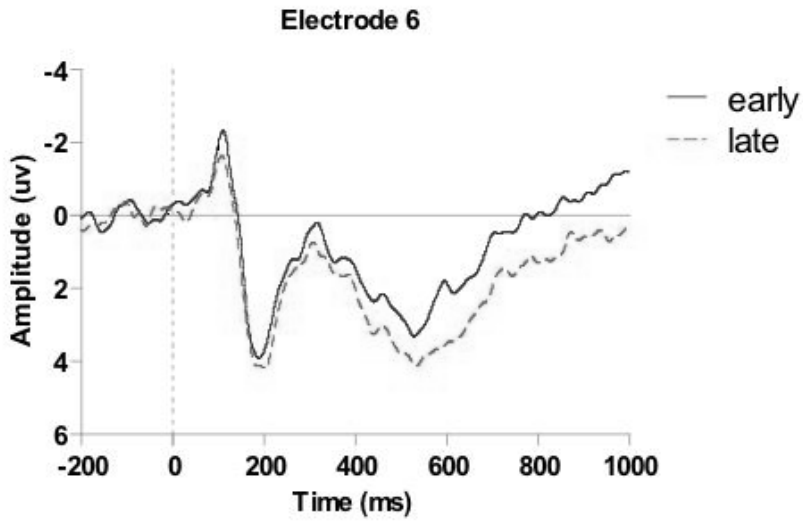

Figure 1. Effect of Age of Acquisition on character recognition in the midline just anterior to Cz.

Conclusion

The results show greater voltage change for late than early acquired words in anterior brain locations. We contend that lexical networks activated by late acquired characters are localised in frontal brain regions consistent with brain imaging studies (Weekes, Chan & Tan, 2008). There was no evidence that the effects of AoA depend on character regularity. AoA has a robust effect on character recognition because relatively few mappings in the lexical network are available compared to alphabetic written words that can take advantage of grapheme to phoneme correspondences learned early in life.

References

Liu Y.Y., Hao, M.L., Hua, S., Tan L-H. & Weekes, B.S. (2008). Age of acquisition effects on oral reading in Chinese. *Psychonomic Bulletin & Review*, *15(2)*, 344-350.

Weekes, B.S., Chan, A., & Tan, L.H. (2008). Effects of age of acquisition on brain activation during Chinese character recognition. *Neuropsychologia*, *46(7)*, 2086-2090.

Weekes, B., Davies, R., Parris, B., & Robinson, G. (2003). Age of acquisition effects in surface dysgraphia. *Aphasiology*, *17(5/6)*, 563-584.